N60201.AR.000390
NS MAYPORT
5090.3a

FIELD ACTIVITIES FINAL LETTER REPORT ADDENDUM TO INTERIM MEASURES WORK PLAN FOR SOLID WASTE MANAGEMENT UNIT 7 NS MAYPORT FL

8/29/1997

BATTELLE

FIELD ACTIVITIES FINAL LETTER REPORT

ADDENDUM TO

INTERIM MEASURE WORK PLAN

FOR SWMU 7
at
NAVAL STATION MAYPORT, FLORIDA

Prepared by:

BATTELLE
505 King Avenue
Columbus, Ohio 43201

For Submission to

Naval Facilities Engineering Service Center
1100 23rd Avenue
Port Hueneme, California 93043-4301

August 29, 1997

FIELD ACTIVITIES FINAL LETTER REPORT
ADDENDUM TO INTERIM MEASURE WORK PLAN
FOR SWMU 7 at NAVAL STATION MAYPORT, FLORIDA

INTRODUCTION

Naval Station (NAVSTA) Mayport is located on a peninsula in northeast Florida and lies approximately 12 miles northeast of Jacksonville. Bounded by the Atlantic Ocean to the east and the St Johns River to the north and west, activities currently include support services for surface fleet and aircraft, including ship and aircraft repair and maintenance. Solid Waste Management Unit (SWMU7) is made up of the Oily Waste Treatment Plant (OWTP) Sludge Drying Beds. Constructed in 1979, SWMU7 consists of unlined sludge drying beds, enclosed by earthen berms. Records indicate that these beds received approximately 1,500 gallons of sludge from the OWTP clarifiers and bilge water from receiving Tanks 99 and 100 on the average of twice per week until late 1994.

SUMMARY OF FIELD ACTIVITIES

Field activities at the two middle sludge drying beds X and Y (Figure 1) were completed June 23 through June 30, 1997, and included a soil-gas survey, soil sampling and analysis, and a soil-gas permeability test. The results of these activities were used in consideration of the recommended design for the full-scale bioventing system. Each completed activity is discussed below.

Soil-Gas Survey

First, a soil-gas survey was conducted to determine which portions of the two sludge drying beds were oxygen limited. The survey was also intended to give some indication of the microbial activity occurring in the sludge drying beds. Conditions of depressed O_2 and elevated CO_2 levels in the soil gas are typical of hydrocarbon-contaminated regions due to high microbial activity. Each of the two sludge drying beds was segmented into a 50-point sampling grid (Figure 1), with intervals between grid points ranging from 15 to 20 ft along the axes. The grid point intervals varied in order to evenly distribute sampling

locations in the asymmetrical sludge drying beds. The width of beds X and Y increased from the south to north boundaries and increased in length from the west to east boundaries. Therefore, the distance between grid points was increased.

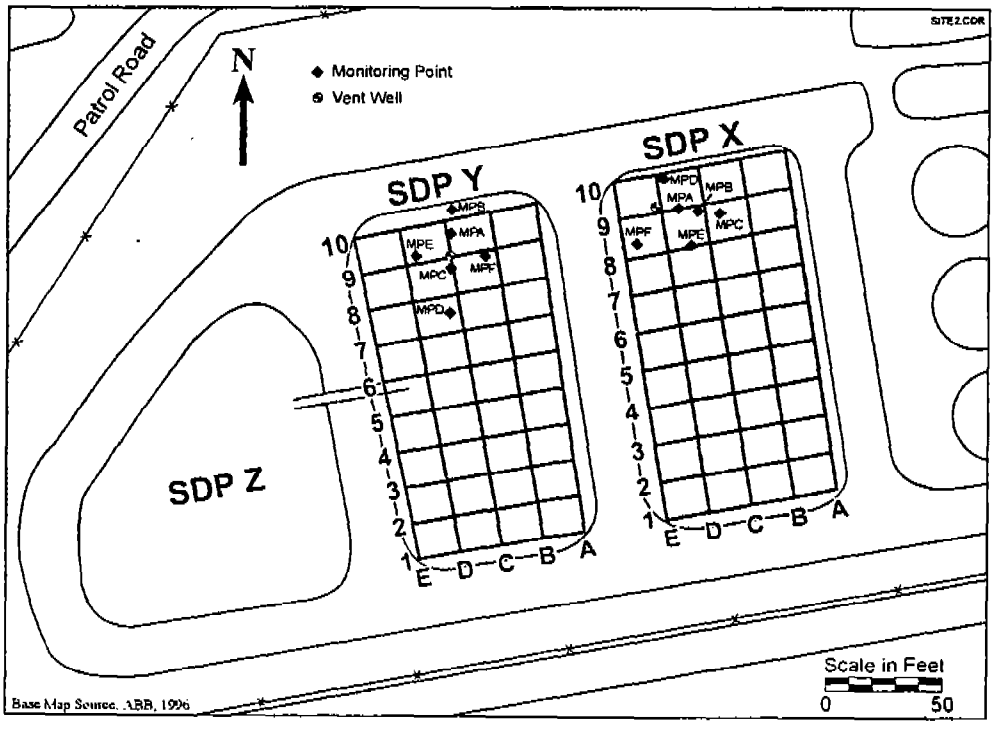

Figure 1. Map of Sludge Drying Pits X and Y with Soil Gas Survey Grid and Permeability Test Installations.

A KVA rod driven to the desired sampling depth was used to collect soil-gas samples. Due to the varying ground elevation, soil-gas samples were collected from a range of 2.0 to 3.5 ft bgs. Because of the below ground surface (bgs) water level or tight sludge deposits, six of the one hundred total sampling locations could not be sampled. The soil gas was analyzed in the field for O_2, CO_2, and total petroleum hydrocarbons (TPH) using portable gas monitoring instruments. O_2 and CO_2 concentrations were measured with a GasTechtor™ portable meter and TPH concentrations were measured with a TraceTechtor™ portable meter. These instruments were calibrated against certified standards daily, prior to use.

Soil-Gas Permeability Test

Upon completion of the soil-gas survey, permeability testing was performed on each sludge drying bed to determine optimal spacing for the bioventing wells. The permeability test was performed by injecting air into a vent well and monitoring pressure changes in various monitoring points at known distances from the well. Air was injected into each well for a minimum of 24 hours. Results from this process were used to determine the bioventing radius of influence. The bioventing radius of influence is the lateral distance air can be moved physically. In practice, the radius of influence is the maximum distance from a vent well where pressure change or an O_2 concentration increase can be measured.

In order to complete the permeability test, monitoring points had to be installed at various distances from the vent well. A total of nine soil-gas monitoring points were installed in the two sludge drying beds, in addition to the previously installed wells and monitoring points (See Figure 1). The monitoring points were installed at approximately 1 to 1.5 ft above the measured water level. Therefore, the monitoring points range in depth from approximately 2.5 to 3.5 ft bgs.

Soil Sampling

Ten soil samples were collected from each of the two sludge drying beds. A sampling scheme was derived in order to attain the most coverage of the beds from the twenty total samples collected. Samples were collected from approximately 1 to 1.5 ft above the groundwater table, using a hand auger with stainless steel 6-in sleeve. The hand auger was driven to the desired depth, where the soil was contained within the sleeve, capped, labeled, and shipped on Blue Ice™ to an offsite laboratory for analysis. The results were used to establish baseline concentrations for future sampling events.

RESULTS AND DISCUSSION

Soil-Gas Survey

A total of 94 soil-gas samples were collected and measured for O_2, CO_2, and TPH and recorded. KVA rods were driven into all 100 sampling locations shown on Figure 1, however, high moisture content or dense soil conditions encountered at six sampling locations prevented soil-gas collection at those points. Results of this survey illustrate soil-gas concentrations from 2 to 3.5ft bgs.

The soil-gas survey revealed that the sediments in both sludge drying beds are fairly uniformly O_2 limited (Figure 2). There were no significant contiguous areas within the beds that had O_2 concentrations above 5%. Isolated locations having elevated O_2 concentrations were observed by field personnel to be highly correlated with the presence of ant hills. As expected, the walls of the beds are more oxygenated than the floors, probably due to the absence of biodegradable material in the walls.

Soil-Gas Permeability Test

Soil gas permeability testing in both sludge drying beds revealed that at a volumetric flowrate of 6.5 - 7.0 scfm per vent well, O_2 concentrations were elevated to 16 to 20% from initial levels near 0% (Table 1) at a distance of approximately 30 ft, as determined by linear regression (Figures 3 and 4). Significant pressure changes, usually considered >0.1 in H_2O, were found to extend to only 14 and 17 ft around the vent wells in sludge drying beds Y and X, respectively (Figures 5 and 6). While oxygenation is the objective of a bioventing system, the pressure and oxygenation results were combined to result in a conservative radius of influence of 25 ft in both sludge drying beds.

Figure 2a. Sludge Drying Bed X Soil-Gas Survey Results: Oxygen Contours (%)

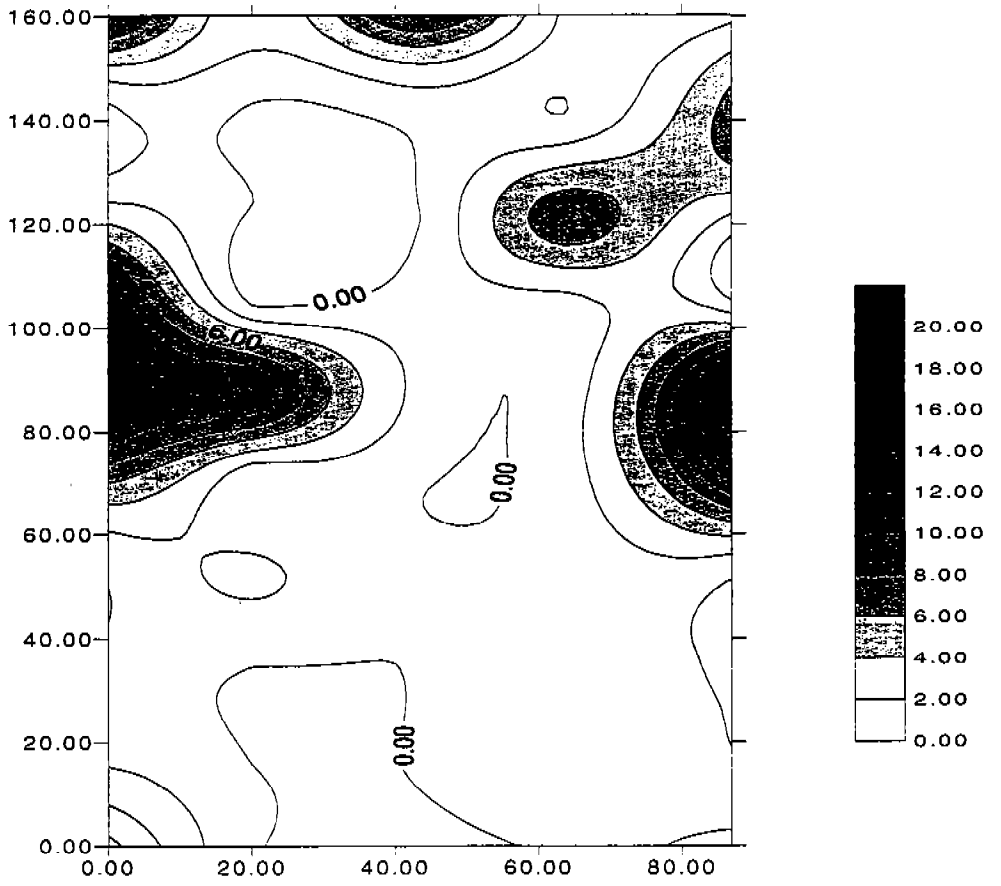

Figure 2b. Sludge Drying Bed Y Soil-Gas Survey Results: Oxygen Contours (%)

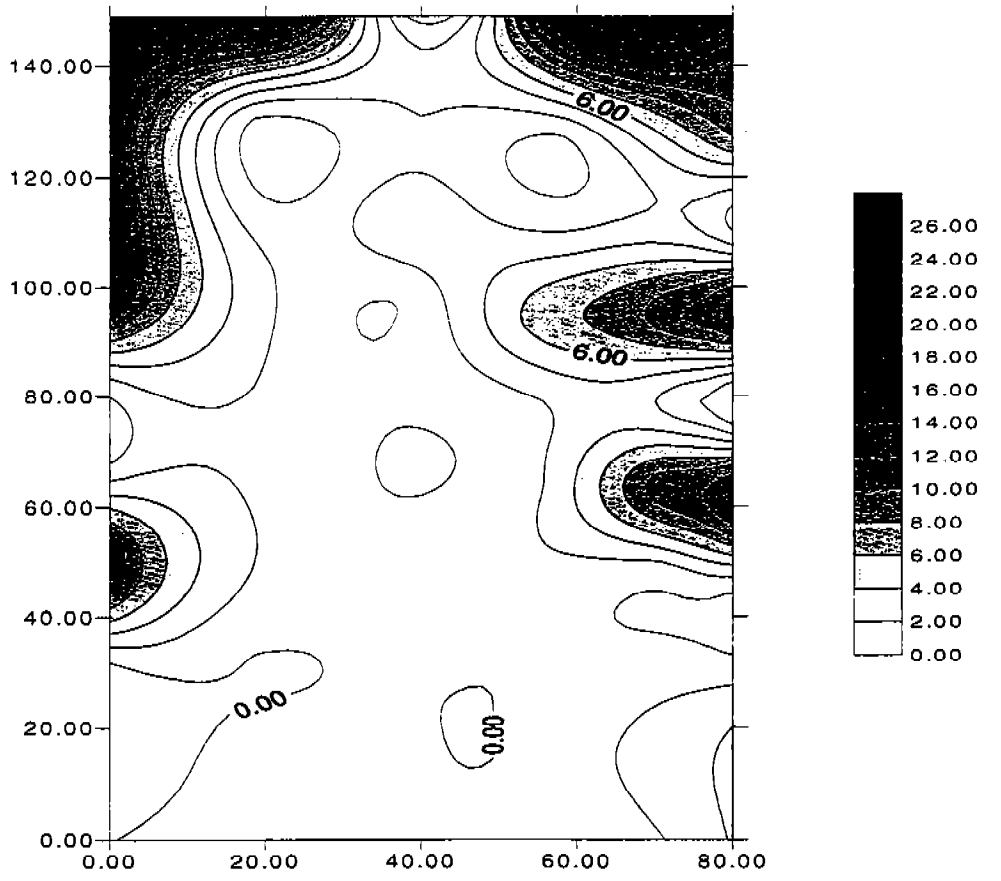

Table 1. Effect of Bioventing on Oxygen Concentrations in Sludge Drying Beds at NAVSTA Mayport, Florida.

	Sludge DryingBed X			*Sludge Drying Bed Y*		
Monitoring Point	**Distance from Vent Well**	**Initial O_2, %**	**Final O_2, %**	**Distance from Vent Well**	**Initial O_2, %**	**Final O_2, %**
A	10	11.8	19	10	0	20
B	18	1.3	19	20	0	19
C	28	1.6	0	5	0	20.5
D	15	1.0	20.5	25	0	3
E	23	0	16	15	0	17.2
F	18	0	18	15	0	17.9

At the end of the soil-gas permeability test in sludge drying bed Y, the injection volumetric flowrate was increased to 15 scfm to determine the effect of this parameter change. Pressures at nearby monitoring points quickly doubled (compared to pressures observed at the original flowrate of 6.75 scfm), but no significant pressure increase was observed at the outermost monitoring point 25 ft from the vent well.

Results from the soil gas survey and soil-gas permeability test verify that the schematic of the bioventing system conceptual design within the Interim Measure Work Plan, submitted by Battelle on March 27, 1997, is recommended for the full-scale system design.

Soil Sampling and Analysis

Table 2 lists the sampling locations and analytical results of soil sampling from sludge drying beds X and Y. Please refer to Figure 1 to identify the approximate location of grid points and sampling locations.

Table 2. Soil Sampling Results from Sludge Drying Beds at NAVSTA Mayport, Florida.

Sludge Drying Bed X				Sludge Drying Bed Y			
Sampling Location/Grid Point ID	Sampling Depth, ft bgs	PAHs, mg/kg	TPH, mg/kg	Sampling Location/ Grid Point ID	Sampling Depth, ft bgs	PAHs, mg/kg	TPH, mg/kg
B2	3.0-3.5	48.7	1800	C3	1.5-2.0	29.4	4300
D2	3.0-3.5	45.7	1300	B2	1.5-2.0	11.6	1200
C3	3.0-3.5	64.3	2200	D2	1.5-2.0	19.6	1900
C4	3.0-3.5	44.0	5100	D5	1.5-2.0	24.2	3600
C5	3.0-3.5	53.9	6600	C5	1.5-2.0	9.9	1500
B5	3.0-3.5	57.9	4700	B5	1.5-2.0	20.7	1000
D5	3.0-3.5	31.0	2000	B9	2.0-2.5	15.0	1800
C8	3.0-3.5	35.6	1700	C6	2.0-2.5	17.9	3500
B9	3.0-3.5	28.8	3500	C7	2.0-2.5	22.3	2200
D9	3.0-3.5	28.7	3300	D9	2.0-2.5	28.6	4100

PAH = polycyclic aromatic hydrocarbon

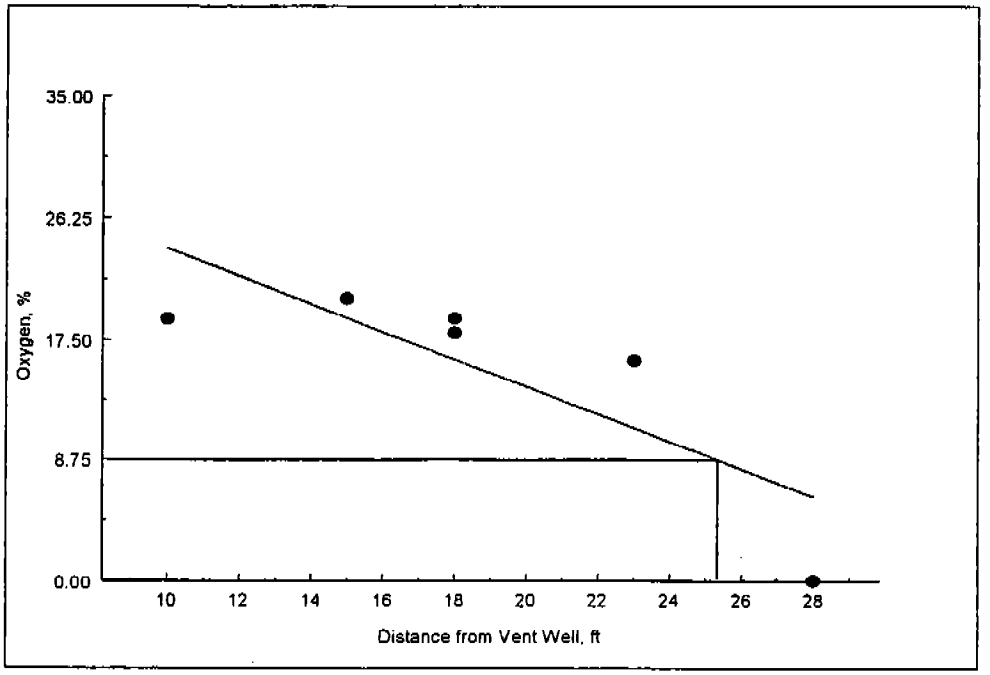

Figure 3. Linear Regression of Distance from Injection Point and Oxygen Concentration After 24 Hours at Sludge Drying Bed X, NAVSTA Mayport, Florida.

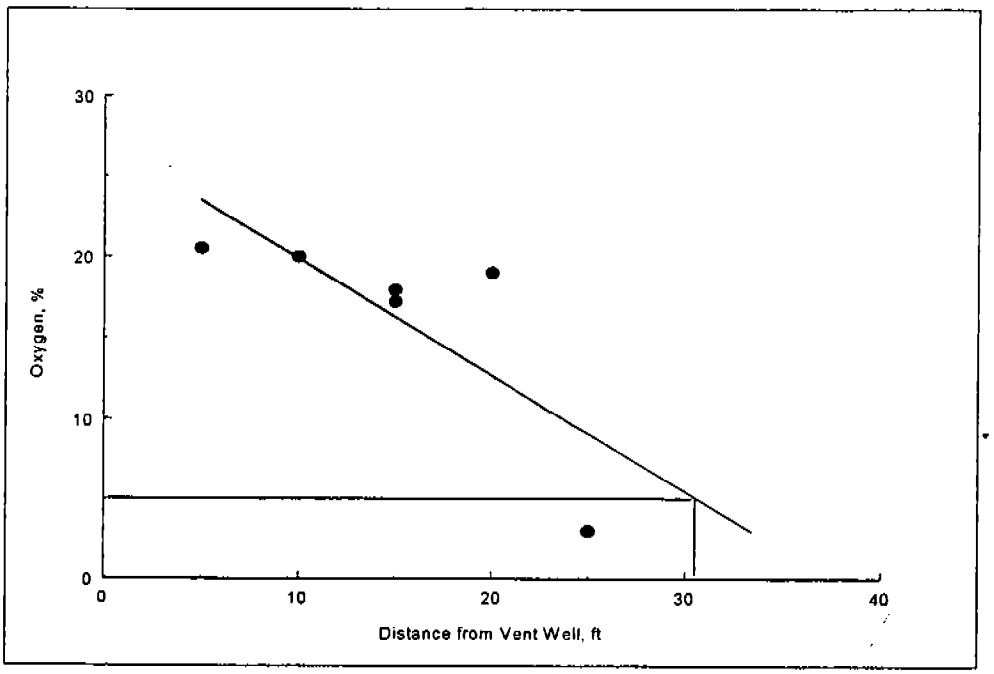

Figure 4. Linear Regression of Distance from Injection Point and Oxygen Concentration After 24 Hours at Sludge Drying Bed Y, NAVSTA Mayport, Florida.

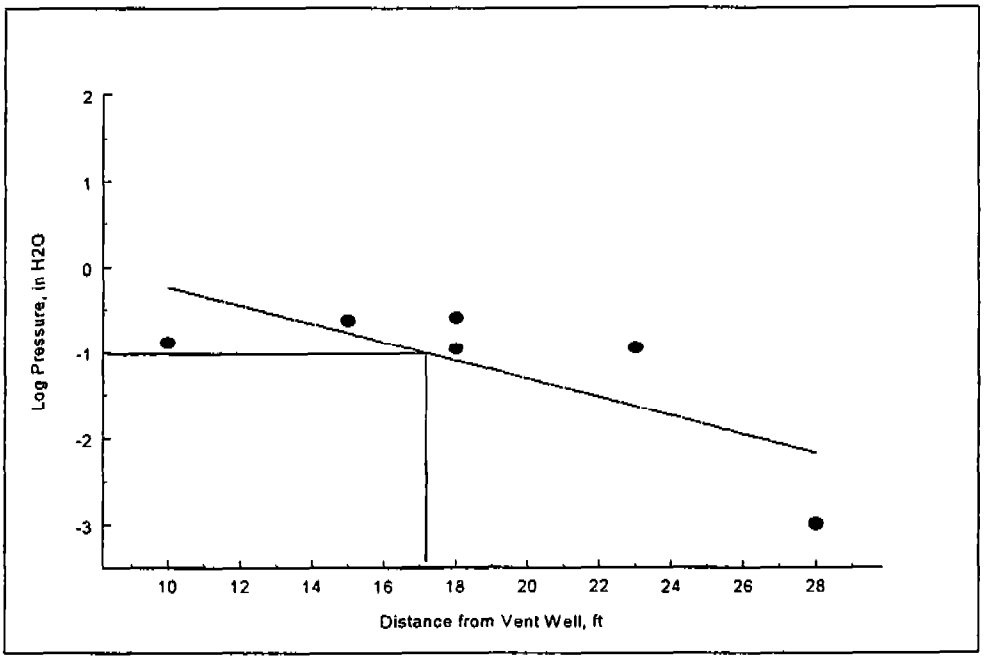

Figure 5. Linear Regression of Distance from Injection Point and Log Pressure at Sludge Drying Bed X, NAVSTA Mayport, Florida.

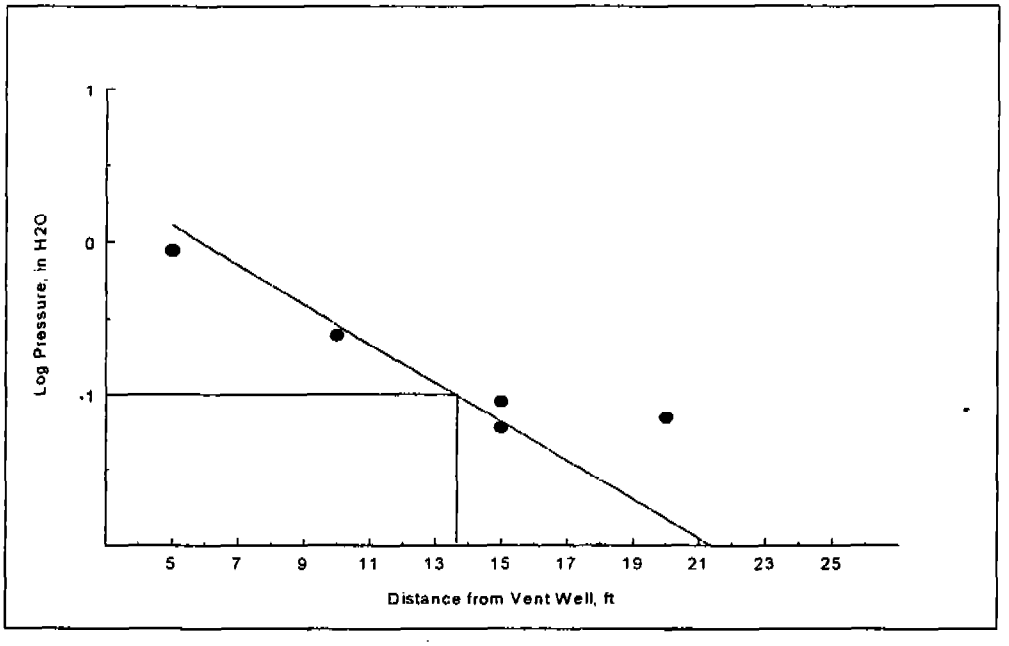

Figure 6. Linear Regression of Distance from Injection Point and Log Pressure at Sludge Drying Bed Y, NAVSTA Mayport, Florida.